

Claims

1. A method of manufacturing a fiber-reinforced composite having high strength by heating and extruding a composite mat comprising a thermoplastic fiber as a matrix resin and a reinforcing fiber combined and matted together, the method comprising the following steps of:
- 5       fibrillating and combining the thermoplastic fiber and the reinforcing fiber, to form the composite mat;
- dispersing and volatilizing the composite mat; and
- needle-punching the dispersed and volatilized composite mat to increase
- 10       dispersibility of the reinforcing fiber in the mat and to maintain a coiled fiber shape and three-dimensional structure of the fiber in the mat, provided that orientation of the reinforcing fiber in the mat is fixed.
2. The method as defined in claim 1, further comprising the step of
- 15       subjecting the composite mat after the needle-punching step to preheating in a preheating zone, melting, compressing and molding in a compressing zone, and cooling in a cooling zone, to obtain a composite sheet.
3. The method as defined in claim 2, further comprising the step of re-heating the composite sheet passed through the compressing zone to increase thickness and width thereof, thereby obtaining a pseudo-foamed composite sheet
- 20       by inherent resilience of the reinforcing fiber.
4. The method as defined in claim 3, wherein the thickness and width of the composite mat are increased by a continuous stainless belt and a magnet roller.
5. An apparatus for manufacturing a fiber-reinforced composite having
- 25       high strength, comprising:

a fibrillating and combining unit of a thermoplastic fiber as a matrix resin and a reinforcing fiber to form a composite mat;

a dispersing and volatilizing unit of the composite mat; and

5 a needle-punching unit of the dispersed and volatilized composite mat to increase dispersibility of the reinforcing fiber in the mat and to maintain a coiled fiber shape and three-dimensional structure of the fiber in the mat, provided that orientation of the reinforcing fiber in the mat is fixed.

6. The apparatus as defined in claim 5, further comprising:

10 a pair of upper and lower rollers for melting, compressing and molding the composite mat passed through the needle-punching unit, conveyed by a continuous stainless belt; and

15 a pressure controlling unit having a spring unit for heating and compressing the rollers so that the thermoplastic resin fiber is melted and the melted thermoplastic resin fiber is impregnated into the reinforcing fiber by the rollers, and for preventing overload of the rollers when the thermoplastic resin fiber is not melted.